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2 November 1984

Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

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NIE RONGZHEN GREETS NUCLEAR FACILITY ANNIVERSARY

OW051036 Beijing XINHUA Domestic Service in Chinese 0811 GMT 5 Oct 84

[Text] Beijing, 5 Oct (XINHUA)--This year 16 October is the 25th anniversary of the establishment of China's nuclear testing base. It is also the 20th anniversary of China's first successful atomic bomb test. In this connection, Nie Rongzhen, vice chairman of the Central Military Commission, recently wrote a congratulatory letter to the comrades of the nuclear testing base.

Nie Rongzhen said in the letter: "This is indeed a grand occasion of double celebrations! Like you, I am celebrating this happy day of historical significance with delight and excitement.

"Owing to your diligent efforts in the past 25 years, the base has been built into a modern comprehensive nuclear testing ground. A large number of outstanding scientific and technical personnel and a command organization and contingent of logistics personnel capable of meeting the needs of continuous development in nuclear tests have been trained, thereby making important contributions to developing strategic nuclear weapons for our country.

"As I said in my congratulatory letter on the 20th founding anniversary of the base research institute last year, comrades from the base have been able to score brilliant achievements under fairly difficult working and living conditions in the remote Gobi Desert mainly because you comrades have served the modernization of our country's national defense with utter devotion. Your noble character has set a good example for hundreds of millions of comrades, teaching them that a genuine revolutionary and people's hero should have the image of keeping the interests of both the country and the world in mind, valuing the revolutionary cause above anything else, regarding hardship as an honor, dedicating one's youth to the magnificant cause of the people, and giving no thought to personal gains or losses. The construction of the base, the building of national defense, and the reinvigoration of the Chinese nation need such noble character. A number of advanced units and individuals that have emerged on the base, such as the 'model meteorological post of Yangpingli' and 'Qian Shaojun, model of national defense science and technology,' are precisely the embodiment of such spirit. I hope that this spirit will continue to be carried forward and used in creating a new situation in the construction of the base and winning victories in building the base."

CSO: 5100/4104

DAYA BAY NUCLEAR GENERATOR NEGOTIATIONS DELAYED

HK220135 Hong Kong SOUTH CHINA MORNING POST in English 22 Oct 84 pp 1, 36

[Article by Albert Chan]

[Text] Negotiations for the supply of generators to the Daya Bay nuclear plant are likely to take longer than expected. The lack of experience by the supplier, General Electric Co, in building generators of this capacity is expected to prolong talks over the contract, sources close to the negotiations said.

It is understood that technical problems have emerged during the long and complex talks which could have been avoided if generators of other makes had been picked in the first place. "Technically speaking and price-wise, GEC should not have been chosen," said one source. "It is not that they do not measure up to the standard--but the job would be easier with other machines," he said.

A fairly large number of changes need to be made to the specifications of the British machines to fit in with the French nuclear reactors. The usual step in planning a nuclear power plant is to decide first the type of reactors to be used and then shop around for the most suitable and compatible turbine generators. The generator supplier sometimes has to make alterations to meet requirements laid down by the reactor supplier.

The fact that GEC was chosen means that a lot of meetings have to be held to sort out the technical details of the many interfaces (connecting parts) between the Framatome (the French reactor manufacturer) and the GEC machines. The sales director of GEC Turbine Generators Ltd, Mr Mike Abrahams, who was involved in the negotiation, told the SCM POST in an interview earlier this year that his company had no experience in constructing the type of 900-megawatt turbines required at the Daya Bay project. He said the company had only built up to 780-megawatt turbines and added that it was a "small step" to move up to the required capacity.

The British company has been a long business associate of China Light and Power Co, and is also the turbine supplier of the power company's Castle Peak power plant.

Meanwhile, the last hurdles surrounding the Framatome contract are expected to be ironed out by the middle of next month after French and Chinese engineers

have sought top-level decisions on some remaining issues from their respective authorities.

After months of discussion in Shumchun, the French delegation from the reactor manufacturer flew back to France towards the end of last week while Chinese officials returned to Peking--both for "top level briefings" before making final decisions on the outstanding issues. According to a senior Framatome official, the engineers will return to Shumchun in November. It is believed that they will then hold what could possibly be the last round of discussions on the contract.

Sources said one issue yet to be finalised is whether Framatome should undertake the whole installation process and employ Chinese workers on site or let the Chinese do the job under French guidance. Although it would be the Chinese workers doing the work, the two arrangements differ in the shouldering of responsibility. In the first arrangement, the French company will have to assume responsibility in case of faults. In the other instance the Chinese would be responsible. A group of Chinese experts are now in France studying Framatome's nuclear plants and its installation techniques to find out whether the Chinese would be capable of undertaking the job at Daya Bay in terms of expertise and equipment. Another major contract was the one with Electricite de France (EDF) which is charged with the overall engineering design of the plant.

CSO: 5100/10

REPORTER VISITS LOP NOR NUCLEAR TESTING GROUND

HK150452 Beijing ZHONGGUO XINWEN SHE in Chinese 0041 GMT 15 Oct 84

[Report by Guo Cheng: "A Visit to Lop Nor Nuclear Testing Ground"]

[Text] Beijing, 15 Oct (ZHONGGUO XINWEN SHE) -- Since the first mushroom cloud rose over the Lop Nor area in Xijiang Region, the remote and uninhabited Gobi Desert, surrounded in a veil of mystery, began to attract the attention of the world.

In mid-summer this year I visited this testing area, China's nuclear testing ground, which has been rocked by thunderous nuclear explosions.

I departed by car from a place called Malan [7456 5695] and headed for the ruins of the ancient city of Loulan [2869 5695]. I happened to be traveling in the same car with Zhang Zhishan [1728 1807 0910], an old friend of mine whom I had not met for a long time. The former commander of the nuclear testing base, Zhang Zhishan told me that the Lop Nor nuclear testing ground, with a total area of more than 100,000 square km, is as large as Zhejiang Province. Nowadays in the testing zone there is a highway network with a total length of more than 2,000 km as well as various facilities for nuclear tests to be carried out on the ground, on towers, in the air, by missiles, in horizontal underground tunnels, or in vertical shafts. At all the test sites command centers, telecommunications units, control centers, permanent monitoring stations, and various facilities were built. A large airport and workshops for the manufacture of product-testing equipment are located somewhere far away. So far a number of nuclear tests have proved that the Lop Nor nuclear testing ground is an ideal place to safely conduct various nuclear tests in different forms and with varying yields.

We drove for many hours along the road which oozed "oil" under scorching sunshine. An odd scene finally presented itself before our eyes -- dilapidated automobiles lay on rocks, armored cars and aircraft had been turned into wreckage, dilapidated concrete buildings could be seen here and there, and part of the surface looked like a melted glaze. It looked as if a large-scale modern war had been fought in the depths of this desert from time ago!

Zhang Zhishan told me: "Here is a testing center for airborne, tower, and ground level nuclear explosions. All these destroyed objects were in nuclear explosion tests." Since 16 October 1964, China has carried out many tower, ground level, and airborne nuclear tests in this location. This place was also the target site of China's first nuclear warhead missile test conducted in October 1966.

Pointing at the wreckage of an steel tower, Zhang Zhishan told me that it was the explosion center of China's first atomic bomb. It was on this 100-meter steel tower that the atomic bomb was placed. Now, the huge steel tower no longer exists -- what one can see is nothing but a mass of melted scrap.

While treading on this strange scorched land, I became a bit nervous. I found some surprising scenes: Green grass growing vigorously in a low-lying spot; and a number of robust gazelles jumping out of the high road culvert, their golden coats shining in the bright sunlight.

Zhang Zhishan said: The annual rainfall in recent years has been about 16 millimeters, but evapotranspiration reaches 3,600 millimeters a year. The area could be a green world if there were sufficient rainfall.

Apart from the ground test zone, I was driven to the shaft nuclear test zone. There nuclear tests are carried out deep in the shafts, which were drilled through hard rock. I came to a shaft which had been used before and found that the mouth of the shaft had been sealed tight. No marked changes could be observed on the nearby ground. Even a nonprofessional would find that underground nuclear tests are safer than those on the ground or in the air, because underground tests can be better shielded.

Zhang Zhishan said: At the moment of a nuclear blast, the thick rock strata will be jolted up and down a number of times. The entremely high temperature and force released from the nuclear blast will form a huge cavity in the unerground rock strata. Because the cavity is deep underground, there will be no subsidence on the ground surface.

Zhang Zhishan said: Like those in other countries, China's nuclear tests have also developed from testing in the atmosphere to underground tests. At present, China is mainly carrying out underground nuclear tests.

During my visit to the test areas people there were busy preparing for another nuclear test. Trucks carrying experimental equipment were speeding along the high roads; scientific and technical personnel were sweating away at their work in tents; and leading cadres of the base and various sections were giving commands at the test site. The quiet site was bustling with activity.

At the mouth of the shaft people were rehearsing the installation of a "experimental product." I saw that several base leaders in charge of technical work were directing the work there. All technicians were working with rapt attention. It seemed that they were handling a real nuclear bomb rather than a dummy one.

The test zone is not suited for the construction of permanent accommodations. The workers in this base have built their own "town" deep in the Gobi Desert, hundreds of kilometers away from the test site. The new town looks like a green aircraft carrier lying in a vast sea of yellow sand. In the past there was only a small stream winding through and some weeds growing there. Now a reservoir has been built to store water flowing from the Tianshan; and row upon row of newly built houses line along the clean streets. Walking along the avenue with trees on both sides, I was relaxed by the cheerful cool wind, like strolling along a beach.

CSO. 5100/4107

AGREEMENT NEAR ON FRENCH REACTORS FOR DAYA BAY

HK150135 Hong Kong SOUTH CHINA MORNING POST in English 15 Oct 84 pp 1, 15

[By Albert Chan]

[Text] The negotiations on the supply of two French nuclear reactors to China between the French Company Framatome and the Guangdong Nuclear Power Joint Venture Company (JVC) are almost complete. The French company submitted a first draft of the contract to the JVC in February and after answering questions and comments from the JVC, sent a second draft in August. Talks between the two sides began immediately after in Shumchun and sources say discussions on the technical aspects of the contract are near completion.

It was learnt that the main contract states that the French company will supply a "complete nuclear island." It also deals with details such as responsibility on either side in the event of accidents, technical faults and equipment delivery. Sources said negotiations on the Framatome deal had gone quite smoothly. "The nuclear reactors in fact are standardised rather than custom-made and Framatome has already built some 26 such plants before," said one sources.

With the technical talking almost over, attention will now focus on the financial side -- such as arranging loans to buy the Framatome equipment.

There are altogether five contracts in the $36 billion project:

-- The joint venture contract between Hong Kong Nuclear Investment Co Ltd and its Chinese counterpart, Guangdong Nuclear Power Investment Inc, for the establishment of the JVC - the corporate organisation to build and operate the plant.

-- The contract between the JVC and Framatome.

-- The contract between JVC and GEC Turbine Generators Ltd, the power generator supplier

-- The contract between JVC and Electricite de France (EDF) for the overall engineering design of the plant.

-- The contract for the supply of "balance of plant" (or BOP) equipment -- that is, equipment other than that supplied by Framatome and GEC.

What has caused concern is the JVC contract between China Light and Power -- at present partnerless in the Hong Kong Nuclear Investment Co Ltd -- and China, because any delay here would delay the project overall.

Theoretically, none of the four contracts should have been signed until the JVC was formed but to speed things the EDF contract was signed last year. The Chinese are confident any obstacles will be cleared and that the JVC will be formally set up. In fact, a new 13-story building in Shumchun with the JVC name-plate on it has been open for business for several months. It is also the main venue for the detailed negotiations between the equipment suppliers and the JVC and between CLP and China.

Progress on the GEC contract is slightly behind that of Framatome, but SCM POST sources said it does not present any problem because the core of the project is the nuclear side of it.

Commenting on safety, a CLP official said the Chinese could competently undertake the construction with guidance from the French. Referring to the U.S. nuclear industry, he said America began with very strict safety rules but as more and more plants were built, there were not enough professionals to go round which explains why there are unqualified welders buying permits to work on nuclear plants. "China has more experts than it requires, the official said.

The arrangements over the sale of electricity to Hong Kong will be contained in the JVC contract. It has been agreed that CLP will be entitled to 25 percent of the electricity generated from the plant, because of its 25 percent stake in the project, but it will have to buy another 45 percent to make up the total 70 percent of power it requires. The deal will have to passed by the Executive Council before CLP can go ahead.

CSO: 5100/4106

CHINA DAILY ON PRC-BRAZIL NUCLEAR ENERGY ACCORD

HK130120 Beijing CHINA DAILY in English 13 Oct 84 p 1

[By "our staff reporter"]

[Text] China and Brazil yesterday signed an agreement to co-operate on the peaceful use of nuclear energy.

Chinese Foreign Affairs Minister Wu Xueqian and Brazilian Ambassador to China Italo Zappa performed the ceremony in Beijing's Great Hall of the People.

The agreement was initialled when Wu visited Brazil last August.

During a brief talk with the Brazilian ambassador before the signing. Wu said that developing countries should co-operate.

The agreement was the first signed by China with a developing country on the peaceful use of nuclear energy, a programme officer of the State Science and Technology Commission told China Daily.

Zappa told Wu that the signing could have a great influence on the world. "It has important political significance as well as important technological significance. We are co-operating on the basis of mutual trust," he said.

Zappa also said Brazilians were curious about China and therefore much concerned about what was happening in the country.

Yang Jun, vice chairman of the State Science and Technology Commission, who took part in the signing, said its main purpose was to develop the relationship between the two countries.

CSO: 5100/4106

FIRST MINI NUCLEAR REACTOR DECLARED OPERATIONAL

OW011530 Beijing XINHUA in English 1438 GMT 1 Sep 84

[Text] Beijing, September 1 (XINHUA)--China's first mini nuclear reactor was declared operational at an appraisal meeting which closed here today. It was designed and manufactured by scientists of the Atomic Energy Institute of the Ministry of Nuclear Industry. The reactor, which went into test operation last March on the outskirts of Beijing, is the second of its kind in the world; the other is in Canada.

Using enriched uranium as fuel, the reactor produces a neutron flux of 1,000 billion per square centimeter and thermo-power of 27 kilowatts. It is at the service of scientific research institutions and production departments. It handles several dozen research items every day, consuming fuel valued at less than one yuan (50 U.S. cents). The reactor can be widely used for research into physics, the environment, earth science, medicine and archeology, as well as in industry and agriculture.

CSO: 5100/4105

GUANGDONG NUCLEAR PLANT CONSTRUCTION CONTINUES

OW020958 Beijing Domestic Service in Mandarin 1200 GMT 1 Sep 84

[Text] The first-phase construction of the Guangdong nuclear power plant, the first nuclear power plant in China, is making headway. Negotiations for various contracts have been smoothly carried out. The Guangdong nuclear power plant is jointly invested, built, and operated by the Guangdong Provincial Nuclear Power Investment Company, Ltd., and Hong Kong Nuclear Power Investment Company.

The nuclear power plant will generate 10 billion kilowatts of electricity annually, equivalent to that generated by a thermal power plant with a capacity of 2 million kilowatt hours, but it will consume 6 million metric tons of coal less than the thermal power plant does. When completed, the nuclear power plant will not only supply plenty of electricity to Guangdong Province and the Hong Kong area but also provide useful experience and technology for building other nuclear power plants in China.

The construction period of the Guangdong nuclear power plant is planned for 6 and 1/2 years. Formal operation of the first generating unit is scheduled in early 1991, with the second generating unit scheduled for July of the same year.

CSO: 5100/4105

BRIEFS

AGREEMENT SIGNED WITH ITALY--Rome, October 6 (XINHUA)--A two-year program of cooperation in nuclear energy between China and Italy was signed here today. Visiting Chinese Minister of Nuclear Industry Jiang Xinxiong and President of the Italian Nuclear Energy Committee Umberto Colombo signed the document. Jiang and his party visited nuclear plants, installations and research centers in Rome, Turin and Genoa after arriving here on September 30. They are scheduled to leave for home on October 8. [Text] [Beijing XINHUA in English 0209 GMT 7 Oct 84 OW]

CSO: 5100/4105

CEMA NUCLEAR DEVELOPMENT, COOPERATION OUTLINED

Milestone In Nuclear Cooperation

Warsaw RZECZPOSPOLITA in Polish 11 Sep 84 p 3

[Article by Krystyna Forowicz: "The Power Industry of the Future; a Jump Into the Atomic Age"]

[Text] Further economic, social and technological progress in our country depends on collaboration with the USSR in energy policy. Joint research and development work and information exchange are required. Undoubtedly, the Soviet Union's scientific-technological and production potential is the foundation for this cooperation.

Nuclear power is one of the most expensive areas of science. Within the CEMA framework, Poland has the opportunity to participate actively in benefiting from CEMA's achievements to satisfy her economic needs. Today, although late, we are taking advantage of this opportunity. In past years we lacked sufficient penetrating force. The old and deeply-rooted traditions of our coal-based power industry did not permit the creation of the atmosphere that was needed to make an early decision to build a nuclear power plant, even though it undoubtedly would have provided a large technological advance for the metallurgy industry and the heavy machinery construction industry, which by now would have had a favorable effect on all of industry. It has only been in the past few years that a change has occurred in this area, and the current programs to develop atomic energy promises hope. The long-term program to expand up to the year 2000 economic and scientific-technical cooperation between Poland and the Soviet Union that was signed in Moscow in May projects the continuation of joint activity to develop nuclear power.

Not Only in Dubna

The most daring projects for an atomic future are occurring in the laboratories of the United Institute for Nuclear Research in Dubna. Here, Polish scientists work with unique, large test equipment such as pulse reactors, accelerators for high-energy particles and heavy ions, and computer centers. They participate actively in complex research that

would be impossible in Poland. Here they earn their professional wings. They participate in 62 of the 120 long-term projects that are being realized in 3- or 5-year cycles.

Last year Krakow's Institute of Nuclear Physics received many profitable orders to install the instrumentation for the IBR-2 reactor, a pulse reactor that is a powerful generator of fast neutrons which has a peak power of 7,700 MW. This unique (on a world scale) equipment is used for research in nuclear physics, solid state physics and biology. Scientists from all the socialist countries use it. The Krakow institute installed this instrumentation for 10 million zlotys.

In addition, Poland offered the Dubna institute many large instruments, which were worth 4.5 million zlotys, to conduct research on high-energy physics. Poland's annual membership fee for the United Institute for Nuclear Research in Dubna is reduced by the value of the apparatus supplied.

Last year Polon specialists participated in the development of an automatic control system for the UKTI heavy-ion synchrotron. The Dubna institute helped to design the AIC-144 isochronous cyclotron at Krakow's Institute of Nuclear Physics.

Polish scientists cooperate via the Dubna institute with other world-famous science centers: the European Center for Nuclear Research in Geneva, the International Agency for Atomic Energy, the European Association CAMAC and others.

We Are a Partner

The PAA [State Atomic Energy Agency], which was established by a February 1982 Sejm statute, coordinates and controls all activities in our country in the area of atomic energy. It is participating in implementing projects of the CEMA Multiyear Directed Program for Cooperation in the fields of energy, fuel and raw materials for the 1990's. The main task today, and for future success, is to master the WWER-1000 reactors. These pressurized water reactors will reduce energy costs in the socialist countries by 10 to 15 percent. In cooperation with the USSR State Committee on Energy Use, work is proceeding in this area on the construction of the SBMEJ [Research-Model Nuclear Power Plant Station].

In association with the Institute of Nuclear Energy of the Soviet Academy of Sciences in Minsk, work is continuing on the joint construction of loops and probes to research construction materials and fuel for dissociating gas-cooled fast reactors (the PUMA program). As a result of this work, whose results were presented at the CEMA forum, the project has been given top priority.

The plan for cooperation between the PAA and the USSR State Committee on the Use of Atomic Energy, which is not based on foreign exchange funds, encompasses 32 themes. The themes include cooperation in the previously mentioned WWER reactors, research on reactor materials, radiochemistry and radioactive fallout, solid state physics, nuclear physics, radioisotope equipment and isotopes. Polish and Soviet scientists from the Institute of Chemistry and Nuclear Technology and the Radium Institute developed methods and equipment to control remotely the reprocessing of spent fuel. They outlined additional detailed tasks to be realized during the 1984-1985 period. Research on the radioactivity of the Baltic Sea is continuing. The GDR is now taking part in this research. Within the framework of a trilateral agreement, additional work has been detailed up to 1990.

The purpose of PAA's participation last year in the work of MZG Interatominstrument's Intergovernmental Commission was for Polon to specialize in the Hindukusz and Sejwal internal-reactor measuring systems during the 1986-1990 period. As a result of the close cooperation between Polish and Soviet specialists, the first Hindukusz control system for the WWER-440 reactor was delivered in December 1983 to a nuclear power plant in Czechoslovakia.

For years we have been active in the CEMA Standing Commission on Cooperation in the Peaceful Use of Atomic Energy. Institutions that are subordinate to the PAA, the higher schools and the Ministry of Mining and Power Industry are the primary executors of the tasks in the area of science and technology. Last year the Polish delegation announced to the Institute of Plasma Physics and Laser Microsynthesis its readiness to develop and build thermonuclear synthesis equipment. Many valuable scientific and technical work toward this end has already been realized.

The Most Important Stage

The closest milestone, if one can express it so, in the scientific cooperation among the socialist countries will be the activization of Poland's first atomic power plant. The international agreement signed in April 1983 between Poland and the USSR calls for the Soviet Union to deliver appropriate material and equipment and to provide technical aid.

Two power units consisting of WWER-440 pressurized water reactors, which were designed by the Soviet Union, will be placed into operation during the first stage of construction. However, the initial operation of the first 465-MW power unit (which will be produced by Elblag's Zamech and the generators by Wroclaw's Dolmed) is projected to occur by 1990, and then the second 465-MW power unit will be put into operation by the end of 1992. The completion of the two twin power units--or the second stage of construction--will occur during the 1993-1994 period. The total power output of Zarnowiec's atomic power plant is supposed to be 1,860 MW. Right now, the ground for the future construction site is being prepared. However, there is no doubt concerning the execution of

the project. We need cheap and abundant energy. Poland's technical ideas, original solutions, accumulated experiences and its huge scientific-technical potential that has been verified in practice augur success in this work. The comradely, partnerlike cooperation also provides such a guarantee.

Emphasis on Nuclear Energy

Warsaw TRYBYNA LUDU in Polish 14 Aug 84 p 6

[Article by Bogdan Mikolajczyk: "A Stake In Atomic Energy"]

[Text] Exactly 30 years ago, the world first heard about Prof Igor Kurtsatov's feat: the atomic power plant placed into operation in Obinsk near Moscow. Its capacity was barely 5 MW, rather small. But much more important than these megawatts was that Professor Kurtsatov presented the world with a peaceful alternative for the use of the atom's enormous energy.

Since that time, the nuclear power industry has developed at a pace that can be compared with a chain reaction. According to the latest data, 320 nuclear power reactors were in operation at yearend 1983. Their total power is 200,000 MW. About twice as many atomic power plants are under construction, and it is estimated that by the year 2000 the output of the world's atomic power plants will exceed 1.5 million MW.

In Line To Join the Club

Currently 25 countries are members of the nuclear power club, but, as is known, Poland is not yet among them. It was only a short time ago that the construction of the first such investment was begun in Zarnowiec. As long ago as 1974 the Soviet Union made an offer to cooperate in building an atomic power plant in Poland. At that time the offer did not fall on fertile ground. Poland said it still had time and that it could wait. It is true that we in Poland possess extensive resources of coal, which has been and will continue to be for many years the foundation of our energy balance. But a realistic evaluation of energy prospects indicates there is an urgent need to master nuclear power in our country. Thus, the time has finally arrived.

Last year the government decided to develop this branch of the power industry. This was followed by the signing of a Polish-Soviet agreement on cooperation to build the Zarnowiec plant, which will be equipped with 440-MW power units. Our experts are investigating the projections for building other higher-power plants. In accordance with preliminary concepts, it is projected that 8 to 10 nuclear power units, each producing 1000 MW, will be in operation in Poland by the end of the 1990's.

In addition to Poland, the first nuclear power plants will be built in Romania and Cuba. But how is this power industry developing in our other neighboring CEMA countries?

Eighteen Giants

In the Soviet Union, which is a pioneer in the peaceful use of atomic energy, 40 reactors having a total power output of 22,000 MW are in operation. An additional 18 reactors, including 1000-MW and 1500-MW giants, are either in the design or construction stage. In the current 5-year period, that is, by the end of 1985, the power output of the Soviet Union's nuclear power plants is expected to increase by 25,000 MW. Thus, the share of atomic power plants in the production of electric energy will exceed 10 percent.

It is fitting here to mention that the USSR is the only country in which three nuclear power plants equipped with fast-neutron breeder reactors are in operation. In these reactors, new nuclear fuel as well as energy are generated during the chain reaction. The amount of new fuel produced is greater than the initial charge. Professor Kurtsatov said: "This is equivalent to taking out more coal instead of ashes from under the grates of a coal-burning stove." In several Soviet urban centers, including Gorkiy and Voronezh, nuclear thermoelectric power plants are being constructed; they will provide heat and hot water for homes.

On the Baltic and South of the Tatra Mountains

In the GDR, the first atomic power plant was put into operation in 1966, near the city of Relsenberg. Compared to today's power plants, it was not a very large plant in terms of power output, which was only 70 MW. During the 1973-1979 period four 440-MW power units were put into operation at the Bruno Lonschiner Nuclear Power Plant on the Baltic Sea. Four more nuclear power plants are under construction for the plant, which produces 12 percent of the GDR's total electric power. Work will continue during the next 5-year period. GDR power engineers have started construction of a power plant with 1000-MW power units near the city of Stendhal. It is projected that they will be operational at the start of the 1990's.

And what is happening on the other side of the Tatra Mountains? In Czechoslovakia two 440-MW power units are in operation. Ten more are under construction. By 1990 one-third of Czechoslovakia's total electric power will be generated by nuclear reactors. By the year 2000 (our neighbor has a future power development plan up to the end of the century) this indicator will increase to 60 percent. For all intents and purposes, they will exceed this limit.

Hungary has Paks, which already has been described in our paper since Polish construction workers also contributed their share to this project. The first power unit became operational in December 1982. Paks will be

enriched in the very near future with three more 440-MW reactors, and it is projected that by 1990 a 1000-MW power unit will be installed. Hungary's experts calculated that a conventional electric power plant having the same power output as the Paks plant would consume 12 million tons of brown coal annually.

Now a few words about nuclear power in Bulgaria. The first power unit of the Kozloduj nuclear power plant (440 MW) was put into complete operation in 1974, and then three twin power units were put in operation in the following years. Bulgaria's atomic power plants supply 30 percent of the total electric current produced in the country, which places Bulgaria among the top nations in this regard!

Two more 1000-MW power units will be installed here. One of them is under construction already. Its operation is projected to start next year. It is the foremost investment of Bulgaria's eighth 5-year period.

From Help to Cooperation

In expanding nuclear power production, the CEMA countries are benefiting from the extensive technical and technological aid of the Soviet Union, who is a world leader in this area. As early as the 1950's, institutes for scientific research of nuclear technology arose in six CEMA countries with Soviet help. Today, 90 institutions of the socialist partners are involved in joint research work on new generation power reactors and on the peaceful use of atomic technology.

This cooperation engendered the agreement on multilateral international cooperation and on specialization in the production of atomic power equipment and their mutual deliveries that was signed over 5 years ago.

Each one of the seven partner-signatories of this agreement, that is, the Soviet Union, Poland, Bulgaria, the GDR, Czechoslovakia, Hungary and Romania, specializes in the production of designated nuclear power plant subassemblies or components. For example, Poland's industry mastered the design of heat exchangers, pressure stabilizers, diesel emergency power stations and the Sejwal and Hindukusz control systems.

All in all, 50 enterprises of the above-mentioned CEMA countries are cooperating with one another in this field, benefiting from Soviet or joint documentation. This entire mechanism is now functioning, providing all interested parties with the measureable benefits that stem from the internat onal division of labor. There are many great illustrations of this cooperation, which has produced a buoyant technical base for the development of nuclear power, a base not possessed by any one country or any other economic grouping in the world.

In accordance with the calculations of the experts, by 1990 the demand for energy in the CEMA countries will increase 2.5 times compared to present demand. By 1990 a series of nuclear power plants having a total power output of 37,000 MW will be built in the European socialist countries. This will save 70 million tons of conventional fuel annually. Through our joint strength, our countries are ready to meet the challenge.

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CSO: 5100/23

BRIEFS

COLOMBIAN-BRAZILIAN NUCLEAR ACCORD--Bogota, 9 Oct (AFP)--President Belisario Betancur today signed a law approving a cooperation agreement between Colombia and Brazil on the peaceful use of nuclear energy. The agreement, signed in Bogota on 12 March 1981, stresses the fundamental importance that both governments place on the use of nuclear energy for peaceful ends, not only as a source of energy in itself, but as a catalyst in scientific and technological development of their countries. Also mentioned is the "need to prevent the proliferation of nuclear weapons through nondiscriminatory measures that would make possible a general and complete nuclear disarmament under strict international control." The cooperation detailed in the agreement covers the areas of exploration, extraction, and processing of mineral uranium, as well as the production of its compounds. The two countries will also prepare projects, construct and operate reactors and other nuclear installations, train technicians, and exchange information and technology. [Text] [Paris AFP in Spanish 2331 GMT 9 Oct 84]

CSO: 5100/2014

NUCLEBRAS REQUESTS REVISION OF BUDGET BY SEPLAN

Adjustment for Inflation

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 19 Sep 84 p 24

[Text] Brasilia--The president of the Brazilian Nuclear Corporation (NUCLEBRAS), Dario Gomes, said yesterday that he is requesting that the Planning Secretariat (Seplan) update the company's budget according to the new parameters approved by the government, in which the admitted inflation goes from 75 percent to 190 percent, and the funds authorized for investment go from 1,074 trillion cruzeiros to 1,431 trillion. Dario Gomes said that with this updated adjustment it will be possible to continue the Angra-II and Angra-III plant projects. NUCLEBRAS has already begun the excavations for the foundations of the latter and is using that material to build the protection dam of the canal carrying water to cool the three plants.

Gomes also announced his intention of initiating two new projects by the end of the year for the mining of uranium and the production of yellow-cake --uranium oxide--in Itataia, Ceara, and in Lagoa Real, Bahia. These projects were approved by Minister of Mines and Energy Cesar Cals.

The Itataia project has an estimated cost of $19 million, which would be used for confirmation of the mineral reserves, and the feasibility study and construction of a pilot plant in the port of Imbituba (Santa Catarina) to test the process of separation of uranium and phosphate. The pilot plant will be installed in Imbituba because of the availability at that site of sulphuric acid, one of the materials used for the separation of the Ceara ore.

Dario Gomes said that this phase should take about 3 years.

A Matter of Priority

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 20 Sep 84 p 26

[Text] NUCLEBRAS is requesting a revision of its budget, which will represent a readjustment on the order of 400 billion cruzeiros. Those funds will be designated for continuation of the nuclear plant II and III projects. The company has already begun excavating the foundations of Angra-III but there are no funds available to take care of this commitment plus the work in the

areas of mining and the installation of the equipment aimed at exploiting the uranium.

In the meantime, Angra-I weighs heavily in the budget, as well as the external commitments, with large debits on which interests and the payment of charges due to delays accrue. Basically, NUCLEBRAS is in a quite peculiar situation because the German supplier continues to deliver part of the equipment imported for the first generating plants and there are no funds for proceeding with the civil works essential for the installation of those machines. And there is a lack of funds simply because the government decided to delay the nuclear program for several years, with which the German manufacturers still appear not to agree. Thus NUCLEBRAS is receiving equipment that is being stored in the Itaguai reactor factory.

Everything is very unusual in this strange project. We admit that in part NUCLEBRAS' budget is out of phase because it used a very low rate in calculating inflation--only 75 percent for a real figure estimated at 190 percent this year. But in the face of the present situation of federal finances, it is necessary to reduce the expenditures of the state enterprises to the maximum, considering principally that the deficit of those enterprises is going to rise to 10 trillion cruzeiros this year, without counting social security. And the cuts must be made in those less priority sectors, among which the nuclear program is unquestionably included.

And within the nuclear program, the projects of the two new hydroelectric plants the energy of which will not be needed by Brazil at least until the year 2000 or 2020... At the present time, the priority in the area of the energy sector is in strengthening the transmission and distribution systems, considering the entrance of operation this year of the two first generators of Itaipu and of the Tucurui plant, which will supply the South-Southeast and the North-Northeast, respectively.

It can be argued that NUCLEBRAS' budget is separate from that of the Brazilian Electric Power Stations Corporation (ELETROBRAS). But, as a philosophy of investment, both are included in the same sector--that of electric energy. For that reason, we believe that NUCLEBRAS should no longer concentrate existing funds on continuing--much less initiating--thermonuclear plant projects, such as Angra-II and III, but on the research and exploitation of uranium and in the intermediate cycle of that ore. Everything else is a bad application of scarce funds because, we insist, nuclear energy will not be necessary to take care of international demand, at least until the end of the century. The delay of those projects is not going to create any problem because the market will be fully supplied. More important still is to recall that, in a hasty decision, the Ministry of Mines and Energy authorized the purchase abroad of coal-fueled thermal plants. Funds are also lacking for execution of even the simple and not at all burdensome civil works of these plants--which are of greater priority than the nuclear plants because they are going to consume national coal which has no market, and likewise will serve for the thermal conclusion of the system. If funds are available, they should take off the coal-fueled thermal program and not thermonuclear generation.

Thus, the Planning Secretariat should study very carefully the request for the release of appropriations made by NUCLEBRAS, considering the priorities of the whole energy system, which place the nuclear program on a fourth level, after the hydroelectric plants, the transmission system and the coal-fueled thermal plants.

8711
CSO: 5100/2000

NUCLEBRAS PRESIDENT DISCUSSES PROGRAM, POLICIES

PY091705 Rio de Janeiro O GLOBO in Portuguese 8 Oct 84 p 13

[Nuclebras President Dario Gomes interviewed at Third Brazilian Energy Congress in Rio de Janeiro on 8 October]

[Text] O GLOBO: Is the government withholding resources from the nuclear program?

Gomes: The government is withholding resources from various areas. It seems that there is nothing against the nuclear program. Early this year when our budget was set at 1.07 trillion cruzeiros on the basis of 75 percent inflation, I felt this sum would be insufficient. I have already requested the increase of those resources, and we are now expecting resources to be increased to 1.431 trillion cruzeiros, which is the minimum necessary for proceeding with important projects.

O GLOBO: The Angra I nuclear plant, which is not part of the nuclear program with the FRG, is several years late in going into commercial operation. Does this affect the general credibility of the Brazilian nuclear program?

Gomes: Angra I was built on the basis of a U.S. plant that had problems in other countries. Despite this fact, we are hoping that the plant will operate normally.

O GLOBO: Angra II and Angra III are already 5 years behind schedule, and we are hearing about new postponements. What would be the repercussion of this project?

Gomes: I can maintain that the current schedule will be complied with, that is, 1989 and 1990, respectively, to begin construction of Angra II and Angra III. Delays have so far been beneficial. The parts that would have been built in the FRG will now be built by Nuclebras Heavy Equipment, NUCLEP, in Brazil, thanks to the delays.

O GLOBO: Is the equipment stored at the Hamburg port costing storage fees?

Gomes: Those pieces of equipment have been transferred to NUCLEP, in Itaguai, and many of them have been installed in Angra II already.

O GLOBO: One of the main criticisms against the Brazilian nuclear program is that the havy equipment manufacturing plant in Itaguai, the NUCLEP, is mostly idle. Is this true?

Gomes: In fact we had 1,100 employees in NUCLEP and now we have 600. As for the degree of idleness of the machinery, it has dropped to 40 percent because we are manufacturing important pieces of equipment, such as condensers, pipes, and pressurizers.

O GLOBO: What kind of report will NUCLEBRAS present to the new government?

Gomes: It will say that the continuity of the nuclear program is necessary. If we have fallen behind in the construction of the nuclear plants, we have had success with production of yellow cake, uranium hexaflouride, and soon we will be enriching uranium, which is now produced by only seven countries in the world and is in the research stage in three others. We are already manufacturing fuel elements, and the [NUCON] Nuclebras Nuclear Plant Construction Company can perform 80 percent of the engineering services for a nuclear plant. NUCLEP exports some heavy equipment for nuclear plants, and the national industry can make some conventional pieces of equipment and can perform assembly work.

O GLOBO: Between 1975 and 1983 the construction of 87 nuclear plants was canceled in the United States. Does this mean nuclear energy is on the decline in the world?

Gomes: Undoubtedly. After the Three Mile Island problem the nuclear energy issue has been reviewed and there has been pressure from social groups. But there are 310 nuclear plants in operation and 120 under construction in the world.

O GLOBO: And the atomic waste problem?

Gomes: It will be solved in the future. At Angra 1 we are going to remove one-third of the used material within a year and place it in a tank for 5 years until a dump site for atomic waste is chosen. Used material will be held for 9 years at Angra II and Angra III. In the near future we will also have reprocessing technology for the recovery of plutonium and uranium from the used material. Only the remainder will be real atomic waste.

O GLOBO: Rex Nazare, president of the National Nuclear Energy Commission, has recently accused the large countries of not transferring to Brazil technology for the manufacture of medical equipment that uses nuclear material. Is the FRG transferring technology for the Angra II nuclear plants?

Gomes: The reaction from other countries proves the success of the nuclear agreement with the FRG. Brazil is receiving all the technology it needs. This is proven by the fact that it exports equipment and will soon manufacture enriched uranium.

O GLOBO: How many countries manufacture enriched uranium?

Gomes: The United States, the Soviet Union, Great Britain, Japan, France, the FRG, and the Netherlands. South Africa, Italy, and Australia are in the laboratory stage. We have no detailed information about Argentina.

CSO: 5100/2016

CNEN PRESIDENT DENOUNCES PRESSURES OF 'NUCLEAR OLIGOPOLY'

Rio de Janeiro O GLOBO in Portuguese 9 Sep 84 p 30

[Text] The chairman of the National Nuclear Energy Commission (CNEN), Rex Nazare Alves, charged yesterday that the big countries are making it ever more difficult for Brazil to gain access to nuclear technology. Those countries which, according to Nazare, represent a "nuclear oligopoly," have been creating obstacles to Brazilian development in peaceful areas such as nuclear medicine (using uranium) and even in the production of heart pacemakers (which use plutonium).

Rex Nazare Alves, who is the Brazilian governor in the assembly of the International Atomic Energy Agency (IAEA), explained that Brazil has followed a clear position in favor of disarmament and the nonproliferation of nuclear weapons. Brazil accepts the imposition of certain limitations called safeguards but it cannot accept mechanisms that "discriminate against and inhibit" the peaceful technological development of nuclear energy.

"Brazil did not adhere to the Treaty on the Nonproliferation of Nuclear Weapons because it considered it discriminatory, because it divides the rights and duties between the countries that have and do not have nuclear weapons. In the meantime, what has happened is the increasing imposition of restrictions on countries that have not signed the treaty. There are political difficulties for the purchase of equipment and even of replacement parts. The fact that the big countries have not even patented their products is proof of the decision to maintain secrecy of a strictly industrial nature, guaranteeing an oligopoly and delaying the access to nuclear technology by the developing countries.

The consistency of the Brazilian position is evidenced by the fact that the country signed and ratified the Tlatelolco Treaty (which provides for the denuclearization of Latin America), committing itself to implement it the moment all that the parties involved fully accept the conditions established in it.

According to Rex Nazare, consistent with its position as an emerging nation and appropriate to its economic condition, Brazil needs to fight whether through an agreement (the transfer of technology) or by its won means (autonomous technology) to guarantee access to nuclear energy for peaceful purposes.

The Big Powers Do Not Allow Modern Technologies To Reach Brazil

According to Rex Nazare Alves, the exclusive American control over nuclear weapons ended in 1949 when the Soviet Union detonated its first bomb. The "Atoms for Peace" program was then created and in 1957 a Brazilian, Ambassador Joao Carlos Muniz, presided over the first meeting of the International Atomic Energy Agency.

Brazil was the 23d member of the agency, believing in its objectives, among which is that of "increasing the contribution of atomic energy to peace and prosperity in the world."

"The objective of Brazil's adherence was to create conditions for obtaining technology through international cooperation. The country accepted the imposition of barriers, the famous safeguards, provided that the peaceful use of the materials, equipment and knowledge received was assured," said Rex Nazare.

According to Nazare, the pressures of the big countries on the agency are becoming stronger and stronger, impeding access to techniques and equipment. Today, it is difficult to obtain technical assistance for the use of uranium even when applied to the production of technetium-99 intended for nuclear medicine; or plutonium for the production of pacemakers.

8711
CSO: 5100/2003

CNEN PRESIDENT REVEALS PARALLEL NUCLEAR PROGRAM

PY172115 Rio de Janeiro O GLOBO in Portuguese 13 Oct 84 p 16

[Text] In recent years the National Commission for Nuclear Energy (CNEN) has carried out a "parallel nuclear program" outside the Brazilian-German nuclear agreement. With 2,600 of its own technicians and the cooperation of research institutes, universities and some enterprises, the CNEN has secretly produced 104 products used in medicine and agriculture, including antipollutants and even equipment for nuclear reactors. This information has been released by CNEN President Rex Nazare Alves. According to the CNEN president, it was not by chance that the government had initially decided to present the finished products but not discuss the projects that led to the production. Nazare Alves said that any divulgence would have made it impossible to import any parts. This shows, according to Nazare Alves, that the restrictions imposed by the industrialized countries against the development of nuclear technology for peaceful purposes in countries like Brazil are increasing.

Among the 104 products, Nazare Alves highlighted in the agricultural field a dwarf wheat variety, a species developed by irradiating seeds that offers greater resistance to diseases and adapts itself better to the climate prevailing in southern Brazil. In the mineral field, thus far Brazil has been exporting beryllium minerals. Thanks to the reactivation of a pilot plant in Minas Gerais, Brazil is now producing beryllium oxide, which was being imported. Yet another product will be used to combat cancer: the ionization chamber for clinical dosimetry. CNEN has also developed a new technique for eliminating pollution from water, a technique that is based on a plant called aguape, which purifies water. "Upon flowing out from the treatment chamber the water appears crystalline and is almost potable," according to CNEN's survey. In the field of nuclear power, CNEN, along with some enterprises and universities, produces the material for the rods used to control nuclear reactors and high-purity zirconium, which had previously been imported and is being used for making the tubes for the nuclear reactors.

CSO: 5100/2016

ANGRA-I NOW OPERATING AT FULL CAPACITY

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 22 Sep 84 p 23

[Text] Rio--Six years behind schedule, the Angra-I nuclear plant began operating at its full power of 626 megawatts yesterday, generating 25 percent of the energy consumed by the city of Rio de Janeiro, but only for a short time because additional stoppages are anticipated in this phase in which Furnas and Westinghouse are conducting the commissioning tests of the nuclear plant.

In fact, Furnas still does not have a scheduled date for the entrance of the Angra-I plant into commercial operation and thus the commissioning tests are dragging on slowly. This commissioning phase serves to test the equipment and the operational safety of the plant. All the defects revealed must be repaired by the construction company, Westinghouse. The guarantee ends only after Furnas operates the plant at its full power for 100 consecutive hours.

Since Furnas does not want to lose that guarantee and considering the numerous problems that have arisen, another stoppage within the next few days is quite possible. According to the predictions of Furnas aides, the Angra-I plant will continue its "firefly" operation, being turned on and off to test its equipment for an undetermined period of time. In this way, Furnas is improving the level of its engineers and physicists (about 280) in the technology of operation of nuclear plants.

The construction of Angra-I began in October 1972 and will have completed 12 years this October, breaking all negative records in terms of the delay of a nuclear plant entering into operation. Prior to that, the record belonged to Argentina, which also had many difficulties with the Embalse-Rio Tercero nuclear plant, with a delay of 10 and a half years. Originally estimated at $400 million, the cost of Angra-I today is set at $1.2 billion and the losses due to the 6 years' delay amount to more than $500 million.

The original date of operation of Angra-I was 1978 but delays arose in the construction phase. In 1982, when the commissioning tests began, there came a notification from Westinghouse to suspend operations because a similar plant was presenting a serious defect, the Ringhals-III in Sweden. Since it

was a construction defect and there were a number of other plants in various countries presenting the same defect, Westinghouse gave preference to those that were already in commercial operation. Furnas went on the waiting list.

After that defect was corrected, several others arose in the past 2 years, including design errors in which damaged equipment did not have serviceable space for repairs, requiring the special consultation of Bechtel. The breaking of the shaft of number 1 water-loading pump, which occurred on 28 May, forced the plant to stop again for 80 days. The function of that pump is to maintain the water level of the primary circuit.

8711
CSO: 5100/2000

FIGUEIREDO OBSERVES IPEN CENTRIFUGE URANIUM ENRICHMENT

'Demythification of IPEN

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 9 Oct 84 p 36

[Text] The "demythificaton" of the facilities of the IPEN [Institute for Nuclear and Energy Research] was announced yesterday by Rex Nazareth, president of the National Nuclear Energy Commission [CNEN]. According to Nazareth, the presence of reporters when President Figueiredo visits IPEN on 11 October will serve to dispel the rumors about the activities conducted there. On that visit, the president will learn about the first totally national experiment in the enrichment of uranium based on the process of the gaseous ultracentrifuge, an alternative to the "Jet Nozzle" (jet centrifuge) principle, which is still presenting problems.

Yesterday, at the Third Brazilian Energy Congress, Rex Nazareth took part in a round table on nuclear energy, with Dario Gomes, president of NUCLEBRAS [Brazilian Nuclear Corporations, Inc]; Jose Goldemberg, president of the CESP [Sao Paulo Electric Power Plants, Inc]; and physicist Luis Pinguelli Rosa, professor at the Federal University of Rio de Janeiro. Despite the presence of Goldemberg and Pinguelli Rosa, two of the biggest critics of the nuclear accord with the FRG, the round table did not generate any major debates: the participants differed, basically, on the ways of executing the Brazilian nuclear program.

Pinguelli Rosa, for example, recommended a revision of the accord with the FRG "to reconcile it" with the research studies developed by IPEN. He added that he disagreed with Dario Gomes, who previously had linked the construction of a larger number of plants to an increasing absorption of technology. In line with Pinguelli, Goldemberg stressed that the contracts had not been signed for construction of any plants after Angra III, which would permit a reevaluation of the entire program.

The president of NUCLEBRAS argued for maintaining the program to build eight plants by 1990, including Iguape I and II, with construction scheduled to begin in 1985 and 1987, respectively. The reference to the construction of these plants on the Sao Paulo coast provoked a reaction from Goldemberg, who said that "the time is past when AI-5 [Institutional Act No 5] can be used to settle all these things."

After the round table had ended, Goldemberg explained the phrase: he said that the Government of Sao Paulo opposed construction of these plants, both because of energy questions and because of possible environmental problems. Earlier, Dario Gomes had stressed that, according to the constitution, the federal government had the authority to decide the location of nuclear plants. "The planning of the electric power system is a national matter; it concerns the entire country and not just Sao Paulo," Dario Gomes explained. Goldemberg foresaw a "squabble" between the federal and state governments. "With all the problems we already have, we can count on this one, as well."

Technological Advance Explained

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 11 Oct 84 p 6

[Excerpt] For 1 and 1/2 hours late yesterday morning, President Figueiredo toured one of the nation's most important centers for applied science, the IPEN (Institute for Nuclear and Energy Research). He learned that the researchers have "an advanced stage program for processing enriched uranium, the UF-6," and are already "in a position to convert the yellow cake produced by NUCLEBRAS in Pocos de Caldas."

The IPEN director explained to the president that the mastery of this technology of radioactive material entailed solutions to many problems, not only the need to maintain nuclear sanitation but also the handling of extremely corrosive reagents, such as nitric acid, hydrogran fluoride and fluorene. Before he left, Figueiredo received a gift from Constance Goncalves da Silva, chief of the IPEN Processing Department: a vial of Talium 201, a substance used for radiodiagnostic examination of cardiovascular ailments and produced with technology also developed by IPEN.

Accompanying the president were Governor Franco Montoro, Vice Governor Orestes Quercia and Helio Guerra, dean of the University of Sao Paulo, where the institute is located. Montoro guaranteed that they did not discuss politics at any time. "There was no talk about the succession. Our positions are clear. We respect the decisions on both sides, and he maintains his public position, which is well known and supported by the people, to follow the succession process and insure that the winner takes office," Montoro said. The governor would not comment on the Agripino Maia incident. He said: "The opposition parties have every interest in keeping the succession process a peaceful one."

Costly Nuclear Accord

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 12 Oct 84 p 3

[Editorial: "The Expensive Technology that Was Never Delivered"]

[Text] The principal news to come out of President Figueiredo's visit to IPEN, in Sao Paulo, was the confirmation that Brazil is developing a new uranium enrichment process, ultracentrifuge, with encouraging results so far. Rex Nazare Alves, president of the National Nuclear Energy Commission (CENE), explained that this research conducted in Sao Paulo parallels the experiments with the

"jet nozzle," the German process included in the nuclear accord signed by Brazil. In that accord, the FRG made the transfer of the technology for this enrichment process contingent upon Brazil's purchase of eight thermonuclear plants, the final cost of which was estimated at $3o billion.

When the treaty was announced, Brazilian technicians and scientists declared that the executive had made a serious mistake, because the German process had not yet been tested. Large doubts persisted as to its economic feasibility, and Brazil would be spending huge sums on experiments which, properly, should be the responsibility of the firms selling the new technology. Now it appears that the Brazilian scientists' allegations have been confirmed, since the CNEN decided to develop a new process, independent of the jet nozzle, and without which it would probably be impossible to enrich the uranium to be used in the future nuclear plants.

This fact illustrates how the nuclear accord signed between Brazil and the FRG was poorly managed, in every respect, since the only justification for signing it was the German promise to transfer the technology for the entire uranium cycle, which no one has seen yet...

Disheartened by this situation, the Brazilian Government became interested in the French exerience, and even announced a new contract, which has not been signed. Now, when the government is committed to purchase four nuclear plants from the FRG (most of the material for two of them is already warehoused in Brazil, and is being paid for), the country finds it must beat the bushes in search of the technology which the Germans promised.

Even if IPEN's present experiments do not lead to total success (the president of CNEN is optimistic), the fact is that the enormity of the Brazilian Government's error in signing the costly treaty with the FRG has been confirmed. Today, this accord, even reduced to the minimum (for which the current government deserves credit), leaves a legacy of debts estimated at $4 billion. This is a lot, but it could be even more if the executive had proceeded with the projects called for in the initial document. It cannot be forgotten that when our officials questioned the number of plants (eight) which the Germans wanted to sell to Brazil, they received an aggressive and totally unconvincing reply: Only with this number of plants would it be economical to transfer the technology for the uranium cycle. Economical for whom? For the Germans? Certainly, if Brazil had accepted that condition, it would in any case still be waiting today for the German technology, which has still not been proven, to the point that CNEN is now searching for alternatives.

In this context, in light of the revelations of the president of the CNEN, the question remains: What about the commitment to transfer the promised know-how? Who is responsible for the failure which has cost the country billions of dollars? In short: Who is responsible for the damage caused by the hasty signing of the Brazilian-FRG nuclear accord?

6362
CSO: 5100/2011

BRIEFS

CALS ON ENRICHMENT TECHNOLOGY--The minister of mines and energy confirmed that Brazil could be producing enriched uranium by February 1985, at the NUCLEI [NUCLEBRAS Isotope Enrichment, Inc] plant in Resende, Rio de Janeiro. Cesar Cals explained that the process now used will not be the only one employed in the country, "because we are conducting research in this sector along with that of the jet centrifuge," the minister said. "Brazil has already determined to master the entire enrichment technology. The practical benefits will be very great, because very few countries in the world can enrich uranium. We can, because we have the world's fifth largest reserve of uranium ore." [Excerpt] [Sao Paulo O ESTADO DE SAO PAULO in Portuguese 9 Oct 84 p 36] 6362

NUCLEAR DETONATION DETECTION--In the next 2 months, through its four major seismological observatories, Brazil will participate in the first test of a system to detect nuclear detonations. When it is inaugurated, the system will monitor compliance with a future treaty completely banning atomic weapons testing. The Brazilian observatories which will participate in the test are those of the University of Brazilia, Caico (Rio Grande do Norte), Valinhos (Sao Paulo) and the National Observatory, in Rio de Janeiro. The tests will run from 15 October to 14 December. The system will initiate the regular exchange of seismographic data among the most important observatories in the world, using the network for the transmission of meteorological information operated by Global Telecommunications System, of the World Meteorological Organization. The system of regular exchange of seismographic data was conceived by a group of experts gathered at the Disarmament Conference in Geneva, in which Brazil participated. The National Meteorological Institute, an agency of the Ministry of Agriculture, will be responsible for foreign retransmissions of seismographic data collected by the Brazilian observatories. [Text] [Rio de Janeiro O GLOBO in Portugese 10 Oct 84 p 6] 6362

NUCLEAR DETECTION NETWORK--Rio de Janeiro, 14 Oct (EFE)--As of Monday, Brazil will join a nuclear explosions detection network to comply with the regulations of the future intercontinental treaty that will ban nuclear tests. An agreement on the establishment of a network of sensors for the detection of nuclear explosions was reached at the Geneva Nuclear Disarmament Conference, of which Brazil is a member. The sensors system is coordinated by the Global Telecommunications System, which connects to a vast network of seismology observatories that will begin operating between 15 October and 15 December. Brazil will join this international network through the National Observatory in Brasilia, the Caico Observatory in Rio Grande do Norte, and the Valinho Observatory in Sao Paulo. [Text] [Madrid EFE in Spanish 2233 GMT 14 Oct 84]

CSO: 5100/2014

NUCLEAR PROGRAM TO ATTAIN ENERGY SELF-SUFFICIENCY DISCUSSED

Paris AFP SCIENCES in French 16 Aug 84 pp 34, 35

[Text] Algiers--Algeria, which has uranium reserves, is preparing to master nuclear technology so that it may launch a program slated to allow it to meet, in about 20 years, 10 percent of its energy needs, according to the most optimistic scenario mentioned in competent circles in Algiers.

There was no question for the authorities of initiating a nuclear program before lifting or reducing to acceptable levels the major political constraint --foreign independence.

Thus, after years of reflection on the country's energy future involving political leaders, researchers, and economists, Algeria decided to build a scientific and technological base that could be the starting point for a national nuclear program, whatever the country's future energy options in the field.

At its present rate of production Algeria will indeed no longer be able to produce oil in 15 years and gas in 70 years. Thus, it has started to endow itself with a human potential and a technological infrastructure necessary to prepare its energy future.

The Nuclear Science and Technology Center was established in Algiers in 1976. Some 200 Algerian researchers and engineers work there in 9 departments on a range of topics from ores and raw materials to the handling of radioactive wastes.

The Center's laboratories, often assembled by its engineers, have made certain steps possible: The production of refined nuclear products, the use of radioisotopes or radiation. It seems that some of the Center's departments are in a position to contribute to the assembly of the most advanced equipment.

Additionally, dozens of this Center's researchers have served in various departments of the French Atomic Energy Commission (CEA) which since 1980 has been bound by a 10-year cooperation agreement to the Algerian Office of Scientific Research (ONRS). This agreement is comparable to those signed by France with Pakistan, Iran, and Iraq.

The authorities are observing the highest degree of discretion as regards Algeria's nuclear projects. Thus, an order which Algeria supposedly gave France in 1980 for the purchase of two reactors--one for the testing of materials and the other for training purposes--has never been confirmed. Similarly, the greatest secrecy surrounds other important projects in which France could be called upon to participate.

Even the agreement already signed 4 years ago between SOFRATOME [French Atomic Projects Company] and SONELGAZ [Algerian National Electric and Gas Company] for the study of technology likely to equip future power stations has never been announced. Algeria does not seem to wish to become a nuclear power but desires to exploit this energy source for peaceful purposes.

Indeed, it possesses in the Hoggar highlands along the country's southernmost border uranium reserves of over 50,000 tons of metal-units. Several foreign firms--namely, Swiss, Belgian, and American--are participating in the preparation of the infrastructure necessary for the exploitation of those deposits whose production is slated to start in the next few years.

The lead time for implementation being particularly long for nuclear energy, it had been decided 5 years ago to take advantage of the current 5-year plan (1980-84) to study the development of the projects. It is therefore conceivable that the next 5-year plan (1985-89), whose major lines were approved by the FLN congress in December 1983, will make it possible to lift the veil on nuclear prospects in Algeria.

Algeria is not placing all its bets on nuclear power in view of the prospective exhaustion of its hydrocarbon deposits but also looks very favorably on the development of solar energy.

2662
CSO: 5100/4600

COMMENTARY ON SELF-SUFFICIENCY IN HEAVY WATER

BK091539 Calcutta THE STATESMAN in English 28 Sep 84 p 6

[From our special representative]

[Text] New Delhi, Sept. 27 — It looks as if India has turned the corner in respect of heavy water production.

Two heavy water plants, at Baroda and Tuticorin, are said to have lately shown a significant improvement in their performance. Both were, until recently, afflicted with interruptions in availability of feed gas and power, reduced gas availability and its deuterium content, and constraints in the plants due to outages of equipment and machinery.

Remedial measures have been taken, and the Tuticorin plant has now exceeded its targeted production.

Besides the Baroda and Tuttcorin plants, each with 45 tons production capacity per annum, there is another plant in operation, at Nangal. The oldest plant, but with the limited production capacity of nine tons per annum, it is also chronically affected by restricted availability of power.

The precise production figures of the three plants is not known: the Government told Parliament some time ago that "it is not considered to be in public interest to disclose the production figures".

The government added, however, tha' the capacities of the existing and the planned heavy water plants were such as to ensure self-sufficiency in heavy water for the country's nuclear power programme.

Two new plants, at Kota and Talcher, are due to be commissioned. The Kota plant, with 85-ton capacity is actually in an advanced stage of commissioning. The Talcher plant is still undergoing tests. Its effective capacity has not been specified.

Two other plants are under construction, at Thalvaishet and Manuguru. The first has a capacity of 110 tons and the second 185 tons.

Quite a few more are evidently being planned — although only one additional project with an effective capacity of 110 tons has been announced — to meet the requirements of the long-term nuclear power programme. It consists of 12 units of 235 NWE and 10 units of 500 NWE size, clearly all of them of the pressurized heavy water reactor type.

Each of these will require a substantial initial supply of heavy water to get started, and some amount each year subsequently — about 12 tons in the case of 235 NWE plant — to make up for operating losses.

CSO: 5100/4702

NUCLEAR POWER 'NOT COST EFFECTIVE' FOR THIRD WORLD

Islamabad THE MUSLIM in English 5 Oct 84 p 4

[Article by Walter C. Paterson: "Nuclear Power and the Third World"]

[Text]

Nuclear power needs the Third World more than the Third World needs nuclear power.

So says British analyst Judith Perera in a searching and provocative study, "Nuclear Power in the Developing Countries," published not by environmentalists but by Financial Times Business Information here at a price of $227. It comes out as nations are preparing for the third review conference for the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), set for Geneva in September 1985, and it provides a concise guide to the issues that will preoccupy conference delegates.

High on the list of issues is the transfer of nuclear technology to Third World countries: which technologies, which recipient countries, and under what conditions? who decides?

Article IV of the NPT says that all parties have the right to participate in the "fullest possible exchange" of nuclear technologies for peaceful purposes. But most ostensibly "peaceful" nuclear technologies can be used for weapons development. Since the NPT came into effect in 1970, the big supplier countries have tried to tighten controls on the export of "sensitive technologies" with more direct uses for weapons.

But they have done so in ways which strike Third World NPT parties as inconsistent and arbitrary. These see the suppliers as having been more generous toward their non-Treaty customers than they have toward fellow NPT members. As a result, the interpretation of Article IV will be a focus of fierce controversy at next year's conference.

Perera's study is unlike most reports on the Third World "nuclear market," which assume the desirability of nuclear power and consider only how much can be installed how quickly. She begins instead with a crisp overview of the energy picture worldwide, and the possible role of nuclear energy in developing countries, noting the many constraints.

Available nuclear power plants are too big for the electricity systems of most Third World countries, which lack skilled people to run them and money to pay for them, she notes.

Also, the "opportunity cost"—the money spend on nuclear energy which cannot be spent elsewhere—is high: "For many developing states, a nuclear power programme is not something to be undertaken lightly. Experience has shown that far from offering a short-cut to development, such a programme can eat up valuable development funds which might be better used."

Perera declares flatly that "the decision of any states to go nuclear is first and foremost a politica[illegible]

one."She surveys the economic, environmental and political considerations that must be taken into account if nuclear decisions are to be soundly-based. But she does not take sides, preferring instead to spell out the conflicts that decisionmakers must resolve.

There are a few minor errors in the study - mostly of dates and reactor types - and one larger misunderstanding that needs correcting. The "guidelines" laid down in the late 1970s by the so-called "London group" of nuclear supplier nations were not more stringent than those of the Non-Proliferation Treaty. In fact, they were significantly weaker.

Article III of the NPT declares unambiguously that nuclear exports to a non-weapons country can take place only if such a country accepts so-called "full-scop" safeguards on all nuclear activities in the country. The London guidelines sidestep this commitment, and nuclear exports to Argentina, Brazil, India, Pakistan and South Africa have all been condoned by suppliers, even though none of these countries is a party to the NPT or accepts full-scope safeguards.

The second half of Perera's study is devoted to profiles of the participants on the world nuclear stage: the original supplier countries and their Third world clients, some of the latter now becoming nuclear supplier themselves.

Perera describes the precarious position of the nuclear industries in the major exporting countries: the United States, France, West Germany, Britain, Canada and the Soviet Union.

For all of these countries, with the possible exception of the Soviet Union, exports to the Third World may be the last lifeline to save their nuclear industries from going under. Even France, widely hailed as having the world's most successful nuclear programme, now faces severe cutbacks in domestic nuclear orders and is seeking any export opportunities it can find.

But the track records of the exporters to the Third World are not encouraging, Perera suggests. For instance, exporters to Brazil, the Philippines and Iran have been so eager for sales that they have hung vastly expensive and burdensome nuclear millstones around the necks of some of their clients.

The short-sighted self-interest of the original suppliers, coupled with the unpredictable changes in their attitude towards controlling weapons proliferation, has prompted many Third World countries to loosen their nuclear ties with the North, and seek nuclear co-operation elsewhere in the Third World

India and Argentina, both outside the umbrella of the NPT, are already bidding to become substantial nuclear exporters themselves. Perera suggests that unless the nuclear suppliers want "to sacrifice their long-term interests for short-term gain they will have to look at the developing countries more as potential partners than as mere markets."

Past experience, however, especially about sales to non-NPT countries, suggests that the nuclear suppliers still put short-term gain above any long-term interests - their own, those of their customers, and those of the planet. Perera's study ought to be required reading for all those concerned about the future of nuclear power, the Non-Proliferation Treaty and life on Earth./Earthscan

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SCIENTIST ON PEACEFUL USE OF NUCLEAR TECHNOLOGY

GF080850 Karachi JASARAT in Urdu 30 Sep 84 p 1

[Excerpts] Karachi, 29 Sep — The Pakistani scientist of so-called atomic bomb fame, Dr Abdul Qadir Khan, has said that anti-Islamic countries, especially Israel and India, were aware that Pakistan had perfected the process for enriching uranium in just 7-years time and that now Pakistan, if it wanted to do so, was able not only to make an atomic bomb, but hydrogen bomb as well. However, Pakistan has no intention of making such a bomb as it intends to use nuclear energy for peaceful purposes.

Dr Abdul Qadir Khan said that the uranium enrichment process took Britain, West Germany, and the Netherlands 25 years to develop and they spent some $2 billion on experiments. Japan spent some $650 million on a somewhat smaller project in this connection, while the United States plans to spend $10 billion on such a plant expected to be completed by 1989. It was with God's help and the selfless dedication of Pakistan's scientists who worked day and night that Pakistan forged way ahead of Indian nuclear technology. Dr Abdul Qadir Khan expressed these views in an exclusive interview with Editor Jalees Salasal of the *'ALAMI ISLAMI DIGEST* magazine.

Dr Abdul Qadir Khan further said that Israel and many other Western countries do not want Pakistan to make progress in nuclear technology. Their attitude is quite inimical. Everyone knows how Iraq and Libya were treated when they tried to develop in this field. The Iraqi scientist Yahya al-Mashiyeh was murdered in broad daylight in the Morid Jamal Hotel in Paris. Israel bombed and destroyed the Iraqi atomic reactor. Now, there are schemes against Pakistan. It is feared that Pakistan's nuclear capability could be useful to the Muslim world.

Dr Abdul Qadir Khan said we do not want to achieve nuclear technology for use against any country and that President Ziaul Haq has repeated assurances that Pakistan wants only to develop nuclear technology for meeting future energy needs for our development programs. The president suggested 2 years ago that India and Pakistan could inspect each other's nuclear advances jointly, to which India has yet to reply. India exploded its atomic bomb on 18 May 1974 and was getting technological help for its reactors from Canada. While doing so, India claimed to adhere to its policy of nonviolence; but in fact it was paying all its attention to the making of arms in this field. India is indeed ahead of Pakistan in certain departments of nuclear technology. This is because former Indian Prime Minister Pandit Nehru had set up an atomic energy commission much earlier and assumed its chairmanship himself. The Indian nuclear program was set up on a sound basis much earlier. In Pakistan little attention was paid to this matter. However, when Dr I. H. Osmani, a learned physicist, was appointed chairman of the Pakistan Atomic Energy Commission, he set up two centers — the (Nelurehen) center and the Karachi Nuclear Power Plant (KANUPP). He also sent several scientists and engineers for studies abroad. All this was done because we lagged far behind India in this field. Now it is for us to narrow the gap as soon as we can. It is a matter of pride, said Dr Abdul Qadir Khan, that he was working with a team of dedicated colleagues. He said that the main hurdle in this field had been the lack of funds, lack of resources, and lack of technical experts. More attention had to be paid to the matter of technical experts, he said. Another hindrance was the bellicose attitude of the developed countries which refused to transfer their technology. This attitude stems from their enemity toward Islam, he said.

Dr Abdul Qadir Khan said that the Indian prime minister and Dr Sethana are misleading their people when they say that Pakistan is a danger to India. How can Pakistan be a danger to India when Pakistan, unlike India, is getting no cooperation from other countries? He said that our nuclear program is peaceful and the enriched uranium produced at the Kahuta plant is to be used as fuel in light water reactors for producing energy.

In reply to a question on what his role would be were Pakistan to be attacked, Dr Abdul Qadir Khan said that, God willing, he will not disappoint the Pakistani nation. He said that his similar reply on a previous occasion was misinterpreted in the Western countries, and it has been said in the Western press that Pakistan had already developed the atomic bomb. But, Dr Abdul Qadir Khan said that if any Pakistani soldier had been asked a similar question he would have answered that he would die for his country, trying to save it at all costs. His reply was also very similar to that of an ordinary soldier of Pakistan, that defending the country was his duty.

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RUMOR OF ATTACK ON NUCLEAR SITES EXAMINED

GF150906 Lahore JANG in Urdu 8 Oct 84 pp 1, 8

[Text]

[Text] According to the *JANG* correspondent in Islamabad, Pakistan has made it very clear that if Israel makes use of Indian territory for an attack on Pakistan's nuclear energy installations, which are engaged in peaceful pursuits, Pakistan will consider it an attack by India. President Ziaul Haq has already referred to this situation in no uncertain terms when he said that if that happened, it will be considered an act presaging a war.

Very reliable sources within the defense establishment have informed the *JANG* correspondent that there is little possibility of a direct Indian attack on Pakistan's nuclear energy installations, because it would be very difficult for Indian bombers to penetrate Pakistani defenses in daylight, and if it is attempted, few Indian planes would be able to return home. The Indian Air Force has numerous British-made Jaguar aircraft which could be used for a night attack. However, Pakistan's Defense Department has devised a special technique to discourage such an attack and destroy the intruders should an attack take place. The special, locally-devised technique envisages the destruction of such aircraft before they are able to reach their targets. The center of Pakistan's nuclear energy installations is at Kahuta, which is some 40 miles from Srinagar in Indian-held Kashmir. Therefore, special defense measures have been employed to prevent any possible attack on Kahuta.

Diplomatic observers in Islamabad, the federal capital, believe that following the failure of the American-Jewish lobby in the U.S. Congress, headed by Senator Cranston, to stop the flow of U.S. aid to Pakistan, resulting in the Congressional decision to continue U.S. aid to Pakistan, the danger of an Israeli attack on Pakistan's nuclear installations has somewhat increased. The threat by the Israeli defense minister that Israel reserves the right to hit any nuclear center in Arab or Islamic countries is already on record. Israel will not hesitate to do so. This threat by Israel was made soon after the Israeli attack on Iraq's nuclear installation with F-15 aircraft given to Israel by the United States. There is also the danger that Israel might try to sabotage Pakistan's nuclear installations. For this, it could find elements in Pakistan among the dissident groups within the country. It is a matter of national importance that President Ziaul Haq take personal interest in matters concerning the defense of Pakistan's nuclear installations.

It is expected that Pakistan will be building more atomic reactors in the near future for meeting the growing energy needs of the country. The government is already engaged in providing funds and choosing a possible location for such future reactors.

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SUGGESTION OF NUCLEAR UMBRELLA FOR PAKISTAN DECRIED

BK181336 Delhi TIMES OF INDIA in English 12 Oct 84 p 6

[Text]

[Editorial: "Letter or Plant"]

[Text] It is clearly impossible for us to vouch for the accuracy or otherwise of President Reagan's reported letter to President Ziaul Haq. On the face of it, it is difficult to believe that a communication of such far-reaching importance — it offers a nuclear umbrella to Pakistan and a continuation of the existing security relationship between the two countries beyond the present provision of 1987 — would not have become known to the American press and that it would have been left to the Washington correspondent of the *NAWA-E WAQT*, Lahore, to disclose its contents.

The timing of it is also rather odd. President Reagan is engaged in an election campaign and should normally be expected to await its result before making such a proposal. This argument would, of course, not hold if the U.S. Administration has reasons to apprehend that Pakistan is about to hold a nuclear test and thus cross the Rubicon. But President Zia cannot possibly be planning to renege on his assurances, however phoney in terms of his intentions and long-term plans, regarding the peaceful nature of his nuclear programme so long as the current U.S. military assistance programme is in operation. He knows that a nuclear test by him would make it virtually impossible for the Reagan administration to continue the military assistance. However, if this line of reasoning would suggest that President Reagan's reported letter is a plant, the nature of the offer, though far-reaching, is in conformity with Washington's broad approach towards Pakistan except in respect of the nuclear umbrella.

There is another line of speculation which could lend a measure of credence to the possibility that President Reagan might in fact have written to President Zia. It cannot, for example, be ruled that President Zia has written to President Reagan saying that Pakistan faces a threat on both the eastern and the western front and that the U.S. chief executive has replied to the Pakistani general to reassure him. There is a catch in this argument. Which is that whatever view General Zia takes of India's nuclear programme and overall designs towards Pakistan and of Soviet-Afghan intentions, he cannot possibly argue that he faces a nuclear threat from either direction.

Why then the U.S. offer of the nuclear umbrella? And we know from our own experience of our discussions with the U.S., the USSR and Britain during the sixties that a nuclear umbrella is not a feasible proposition without bases and storage of nuclear weapons in that country. Like the multilateral force which President Kennedy proposed for Europe and then abandoned as being unpracticable, the concept of a nuclear umbrella raises too many problems. But it is on the other hand, possible that President Reagan has made the offer as a kind of ploy to persuade Pakistan to accede to the non-proliferation treaty.

Leaving the nuclear issue aside, however, it can safely be assumed that the U.S. would be willing to do whatever is necessary to reassure Pakistan about its security, that it would have no objection to the transfer of AWACS by Saudi Arabia to Islamabad and that it would wish to continue the present security relationship beyond 1987. This does not prove that Mr Reagan has sent a specific communication to President Zia. But that is not a particularly important issue for us in India to settle. We are more interested in assessing the U.S. view of its ties with Pakistan and in that context the *NAWA-E WAQT* report is interesting regardless of whether it is accurate or whether it is a plant.

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'NUCLEAR-CAPABLE MISSILES' FOR PAKISTAN

LD090954 Moscow TASS in English 0926 GMT 9 Oct 84

[Text] New Delhi 9 October TASS--Pakistan and the West German company Otrag recently concluded a secret deal under which Pakistan will receive a major shipment of medium-range nuclear-capable missiles, the India press agency reports. Otrag, which some time ago helped the racist South African regime to acquire missiles, will also build a plant to assemble components for West German-made missiles. At present Pakistan is pressing ahead with a programme to develop nuclear weapons. Technology and equipment for the programme have been supplied by NATO countries, the main backers of Islamabad's nuclear ambitions, the news agency stresses.

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EXCERPTS FROM 1983 CEA ANNUAL REPORT; REPROCESSING

Paris CEA ANNUAL REPORT, 1983 in French 1984 pp 24, 27, 28, 83

[Text] Natural Uranium, Graphite-Moderated, Gas-Cooled Reactors

The six reactors of the UNGG [natural uranium, graphite-moderated, gas-cooled] system still in operation represent an installed capacity of 1960 MW(E), to which there must be added 480 MW(E) from the Spanish reactor of Vandellos of which the French Electric Company (EDF) holds 25 percent of the production. In 1983 they produced 6 percent of French electrical energy of nuclear origin, a figure which is the lowest of those recorded to date. This is due in part to the extension of the PWR system, but also to the reduced operation of the UNGG reactors during the past year.

The problems of corrosion of the steels by hot carbon dioxide (temperature greater than 380 degrees C) which appeared particularly in 1982, will give rise, in 1984, to considerable service of Chinon A 3. Moreover, to avoid the loss of reactivity due to hydrogenated deposits of the Eugey 1 reactor, it has been decided to feed it with slightly enriched (0.7 percent) fuel. This solution had been contemplated since the project study when the necessity of injecting methane to fight corrosion of the pile-up of graphite appeared.

For this system, the NEC provides a technical follow-up of the installations and assistance to the user, EDF, as a function of the needs which appear. It plays a special role with regard to the use of the fuels made by Cogema, fuels which retain a very high rate of reliability.

Reprocessing Spent Fuels

In this field, the research and development activities were marked in 1983 by five important stages:

1. The start of construction, at the La Hague site, of the large shops of the future UP 3 plant, which was made possible by the results previously obtained in the laboratories of the NEC and the research offices of SGN and whose development, however, from now on will exert a very strong constraint on the R and D programs to end in the next few years;

2. The completion of the main phases of construction of the TOR [Processing of Fast Oxides] project for expansion and modernization of the Marcoule pilot plant which will allow installation of the equipment, and performance of tests in an inactive medium, starting in 1984;

3. The reorientation of the Cogema plant project for the fuels of the fast neutron system, the size of which was reduced, but whose timetable was met in order to meet the 1986 schedule. This gives priority to research connected with the most specific innovations of the project;

4. The emphasis on the activities directly connected with reprocessing; on the one hand, studies for the management of the "exotic" fuels (experimental, damaged, etc., that cannot go directly through the Cogema plants) and on the other hand, the development of techniques for dismantling operations of the nuclear installations;

5. The beginning of consideration of the recommendations of the Castaing working group, whose report was published at the end of 1982, particularly concerning the research on the thorough reprocessing and on handling of spent fuels, by ways other than immediate reprocessing.

In the field of water reactors, studies on the chemistry of technetium, a destabilizing element for the extractions, and on the use of new reagents, such as hydrazine carbonate, facilitating the handling of wastes, were performed at Fontenay-aux-Roses. A new oxidizing dissolution process for plutonium oxide was developed. The theoretical work of designing the operation for the extractions in pulsed columns progressed.

At Marcoule, the various prototypes of UP 3 equipment were used. The chopper was used to develop, in cooperation with SGN, the most fragile components; the continuous dissolver, "bucket wheel" type, underwent tests for mechanical endurance and for dissolution of uranium oxide; the bank of the ring column was extended and the operation, after coupling the columns, was able to be tested; the prototype of the acid recuperator, under reduced pressure, was installed; a revolving bowl percipitator of plutonium oxide was studied for Cogema.

Other tasks in support of the chemistry activities were also pursued. These include the mechanical reliability studies for the wheel dissolver, research on the materials resistant to corrosion in a nitric medium, particularly on zirconium and its alloys, development of the methods of automatic and remote analysis (by fiber optics), the experimentation at La Hague for the nuclear instrumentations planned for UP 3, particularly to measure the rate of combustion of the assemblies at their entry into the plant.

Moreover, the NEC is conducting activities to promote the modern means of remote operation. In 1983, a mechanical remote manipulator produced by French industry was tested for a long time; the satisfactory results enabled Cogema to pass control of a series of the French supplier. An electronic and programmable remote manipulator, designed by the NEC, is

also being tested to provide many more possibilities for remote operation in the plants.

With regard to the system of fast neutron reactors, the rating of the process for storing spent fuels in water has been brought to term; a plant of this type will be built on the Creys-Malville site.

The process of breakdown by cracking of the hexagonal fuel tubes was successfully tested, for the first time in active medium, on elements coming from the Phenix reactor. Its use is contemplated in the Marcoule ISAI installation, then later, in the Cogema plant project. The continuous dissolution of very spent (100,000 MWd/t) fuel pins was undertaken in a shielded channel at Fontenay-aux-Roses where the behavior during the nitric attack on the various types of cladding was observed. The main effort, devoted in 1983 to specific equipment, dealt with the design study of a continuous dissolver with a helical ramp, a first version of which will be mounted in TOR in parallel with the standard batch dissolver.

In addition to the laboratory research, the NEC contributes significantly to the definition of the basic data on the new Cogema project (MAR 600) intended to reprocess industrially the fuels of the first breeder reactors, by taking over the preliminary study of the process diagrams.

The Marcoule pilot plant (SAP) had a regular operation during the first half of 1983; 1600 kg of uranium and plutonium were dissolved and 300 kg of plutonium extracted. During this period, various measurements and observations were made, including an evaluation of the fission products, followed by neptunium, a test of the trapping of iodine on zeolites, experimentation of the processing of the solvent by hydrazine carbonate. The activity of the SAP was then stopped, the progress of the developments of the TOR project having made it possible to undertake, in the second half of the year, the connections with the rest of the pilot plant. Final construction work and the start-up tests in an inactive medium will be carried out in 1984.

As part of the international cooperation of technology transfer, in addition to the exchanges with Great Britain which occur regularly, negotiations with other countries having plant projects, such as the Federal Republic of Germany and Japan, took place in 1983.

Reprocessing of Spent Fuels

1983 confirmed the expertise acquired by Cogema in the field of reprocessing fuels of the regular water system. The plant at La Hague reprocessed 221 tons of this category of fuel in 1983. Since the HAO [High-Level Oxide Shop] head was placed in service in 1976, the commulated processed amount represents more than 50 percent of the world tonnage. The installations at La Hague and at Marcoule have, in addition, reprocessed 214 tons of civilian fuel from the UNGG system.

The important program for expansion of the plant at La Hague, undertaken several years ago, was actively pursued in 1983. The new installations of average plutonium activity and the new building for storage of the plutonium were placed in service.

At Marcoule, the unit for storing and decladding of the MAR 400 spent fuel went into the operational phase in September. Moreover, the project for a new station for processing effluents should be presented in 1984. Finally, in the shipping field, Cogema took a 24.26 percent share in the Transnuclear company during the year.

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